Multiple reference frames for saccadic planning in the human parietal cortex

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Abstract:

We apply functional magnetic resonance imaging and multivariate analysis methods to study the coordinate frame in which saccades are represented in the human cortex. Subjects performed a memory-guided saccade task in which equal-amplitude eye movements were executed from several starting points to various directions. Response patterns during the memory period for same-vector saccades were correlated in the frontal eye fields and the intraparietal sulcus (IPS), indicating a retinotopic representation. Interestingly, response patterns in the middle aspect of the IPS were also correlated for saccades made to the same destination point, even when their movement vector was different. Thus, this region also contains information about saccade destination in (at least) a head-centered coordinate frame. This finding may explain behavioral and neuropsychological studies demonstrating that eye movements are also anchored to an egocentric or an allocentric representation of space rather than strictly to the retinal visual input and that parietal cortex is involved in maintaining these representations of space.

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